N. S. W. GOVT. RLYS.
CHIEF ELECTRICAL ENGINEER'S BRANCH
Supervising Engineer.
R. H. MacKay
36/7910 P.H.S.

Boiler Cleaning Tools

BABCOCK & WILCOX
LONDON AND RENFREW

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CHIEF ELECTRICAL ENGINEER'S BRANCH
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BOILER CLEANING TOOLS

BABCOCK & WILCOX LTD.

LONDON AND RENFREW

APRIL, 1935. *Code Word :* CBBCT No. 856C.

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Principal Works : RENFREW, Scotland

BRANCH WORKS : Oldbury, England ; Dumbarton, Scotland ; and Australia

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Representatives and Agents throughout the World.

THE BABCOCK & WILCOX
ELECTRICAL TUBE CLEANER
IN OPERATION

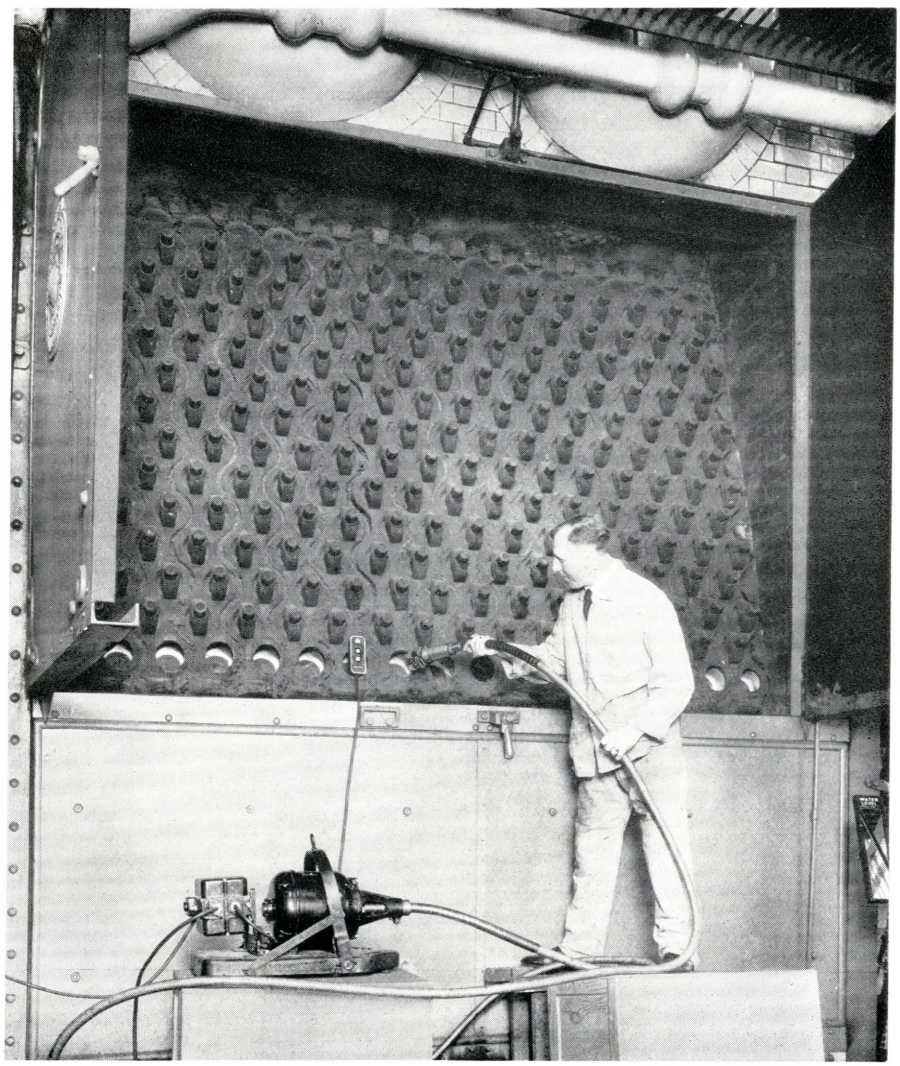

Illustration of Standard Electric Tube Cleaner in operation. Note remote control panel giving operator complete control.

OVER

188,000,000

SQUARE FEET OF HEATING SURFACE

LAND TYPE

AND OVER

26,600,000

SQUARE FEET OF HEATING SURFACE

MARINE TYPE BOILERS

IN USE OR ON ORDER THROUGHOUT THE WORLD

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BOILER TUBES

AND

BOILER SCALE

ONE of the most important problems that has faced the Engineer since the early days of the steam boiler, has been to successfully combat the formation of scale. Most power plants have to use the water which is at hand, and it nearly always contains scale forming properties. This scale formation on the tubes, as is well known, has an extremely detrimental effect upon the efficiency of boilers. It is always advisable to chemically treat the feed water which will minimise the deposition of scale, but in many cases local conditions do not allow for the entire prevention of scale formation and once this has formed there is only one way to remove it—mechanical cleaning.

In attempting to solve this problem many methods of combating scale have been tried, but the only positive way to keep boilers in good working condition is to frequently clean the tubes by mechanical means. This method is entirely satisfactory, being simple, economical

and sure. Without further comment we confidently leave the choice of a cleaning method to the experience of the average Engineer.

Mechanical Tube Cleaners represent modern boiler room practice in removing scale.

The various cleaners illustrated and described in this catalogue are the result of many years' experience, our aim having been to supply machines which will give maximum amount of power and speed.

Having in mind that Tube Cleaners as a rule are subjected to more abuse than any other tool used in the boiler house, these machines are made to stand up under severe usage and their construction is very simple and strong.

The selection of a particular type of cleaner for any given work depends upon the conditions to be met, such as the size and design of the boiler tubes, nature and thickness of the scale to be removed, and facilities at hand for driving the cleaner.

Representative cleaners are shown and described in this catalogue. It is obviously impossible to illustrate the many variations in size and proportions necessary to suit cleaners to the numerous ranges of tubes and pipes to be encountered. Cleaners are practical in sizes ranging from $\frac{5}{8}''$ to 12″ diameter.

Any one examining these cleaners will find the most accurate and highest grade of workmanship, apparent in every detail. All parts are interchangeable, and all internal mechanism is hardened and ground to a thousandth of an inch accuracy.

Care and operation of water and air driven cleaners

THE operation of a tube cleaner is a very simple matter, but maximum results are obtained only by careful handling.

When not in use, the cleaner should be immersed in oil.

Worn parts should be replaced promptly and thus prolong the life of the cleaner.

In using air driven cleaners, a stream of water should be introduced into the tube by means of a small hose, in order to cool the cutters and wash away the scale removed.

Cleaners should be operated by water or air at the pressures recommended, otherwise at lower pressures the machines cannot be expected to do maximum work. Care should be taken to see that the correct pressure is actually in effect at the cleaner when running at full speed.

It is a mistake to operate machines with smaller hose than that recommended, as this will prevent the cleaner from developing full speed and power.

Care should be taken to see that no dirt is carried into the cleaner with water or air, as this will only close the ports and cause serious trouble in the operation of the machine. It is always advisable to blow down the supply line before commencing to work.

In operating, the cleaner should be allowed to enter the tube just as fast as it will cut its way. No attempt should be made to force it, as this will damage the machine and cut down the speed. By allowing the cleaner to work its way into the tube and sweeping it back and forth over a given distance, the operator will soon learn by the ' feel ' just what the cleaner is doing and when the scale is removed. The length of time required to clean each tube depends upon the condition and nature of the scale.

The machine should not be allowed to pass out at the far end of the tube, as by doing this the cutter head can be severely damaged. The machine should be watched during cleaning of first tube and when the head reaches lower end of tube, a mark can then be made on the hose so that the operator will know when the cleaner is through the tube.

Thrust-bearing Water driven Cleaners

THESE are heavy-duty cleaners, developing the maximum power and speed of which a water driven cleaner is capable. They are constructed of first class Admiralty gunmetal with long and well balanced bearings and will stand up and give excellent service even with hard usage. These cleaners are built for all sizes of tubes, either straight or curved.

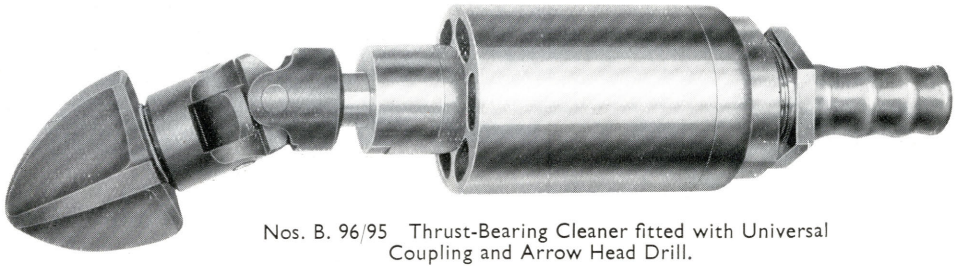
Shaft and bushings are of steel, carefully hardened and ground. The outer case is made from a solid piece of gunmetal whilst the revolving turbine is milled from solid gunmetal also. The careful design of the vanes ensures the highest efficiency. End thrust is taken by a removable thrust cap and thrust washer. Bearing surfaces are water cooled and lubricated.

These cleaners may be taken apart by removing the cutter head, thrust cap (left hand thread) and rear disc (left hand thread). The centre shaft may then be taken out of the front end. The thrust washer should be renewed when it becomes worn, in order to keep the machine in correct alignment, and avoid end play.

Thrust-Bearing Cleaners are equipped with Quick Repair Cutter Heads, also Arrow Head Drills, Flat Drills or Porcupine Heads with Universal Coupling. The equipment includes a complete set of replace parts for the Quick Repair Cutter Head. For description and illustrations of cutter heads and drills used with these Thrust-Bearing Cleaners, please refer to pages 31/33.

For maximum results, we recommend the use of 120 lbs. per square inch water pressure in the case of $2\frac{1}{2}''$ — $4''$ machines, with 100 lbs. for smaller cleaners. Lower pressures can be used with quite good results, but the speed and power will be somewhat reduced.

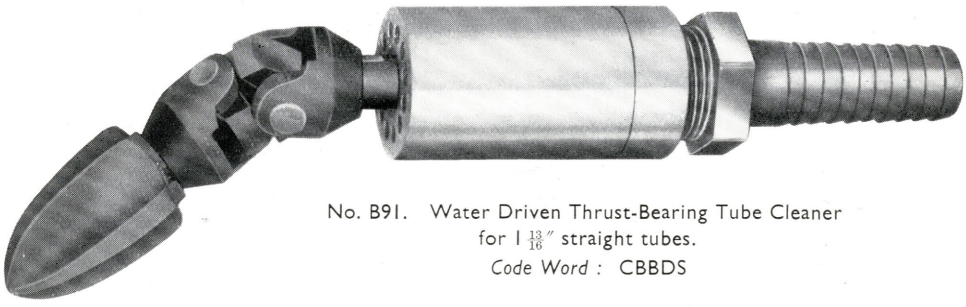
We recommend that $1''$ hose be used with $2''$ and $2\frac{1}{2}''$ machines, $1\frac{1}{4}''$ hose for $3''$ and $3\frac{1}{4}''$ cleaners, and $1\frac{1}{2}''$ hose for $3\frac{1}{2}''$ and $4''$ machines.



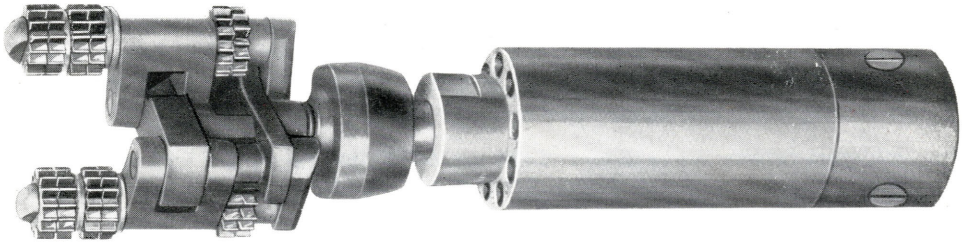
Nos. B. 96/95 Thrust-Bearing Cleaner fitted with Universal Coupling and Arrow Head Drill.

Representative Thrust-bearing Cleaners

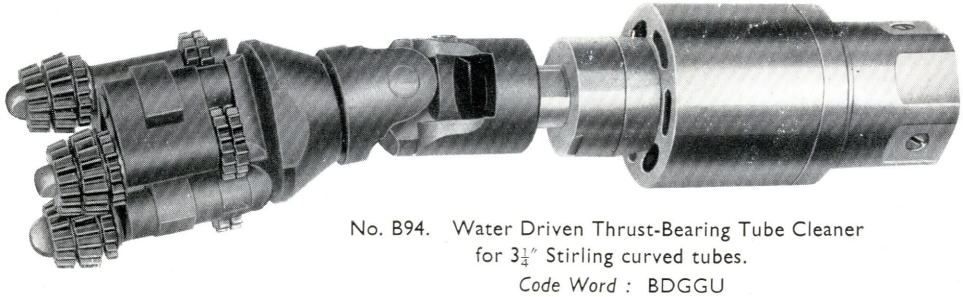
THE cleaners illustrated on this page represent standard sizes of thrust-bearing water driven cleaners. Machines for curved tubes use a short bodied motor and a universal coupling for flexibility in negotiating the bends.



No. B91. Water Driven Thrust-Bearing Tube Cleaner for $1\frac{13}{16}''$ straight tubes.
Code Word : CBBDS



No. B92. Water Driven Thrust-Bearing Tube Cleaner for $2\frac{1}{4}''$ straight or curved tubes.
Code Word : CBBFH

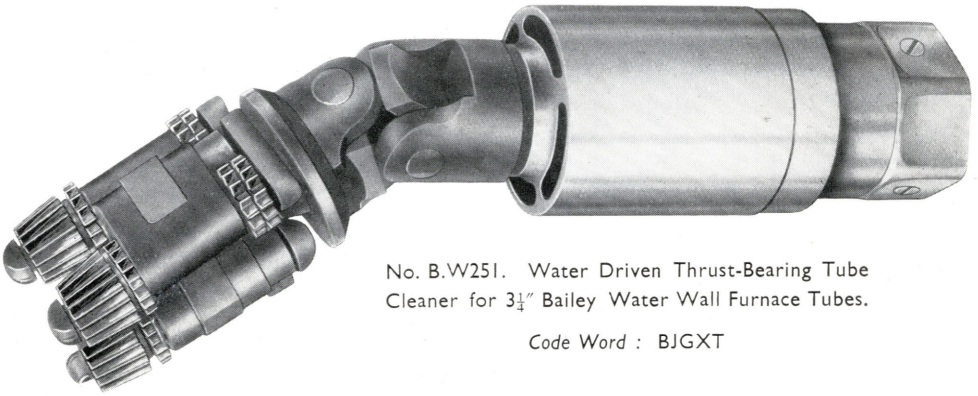


No. B94. Water Driven Thrust-Bearing Tube Cleaner for $3\frac{1}{4}''$ Stirling curved tubes.
Code Word : BDGGU

Representative Thrust-bearing Cleaners

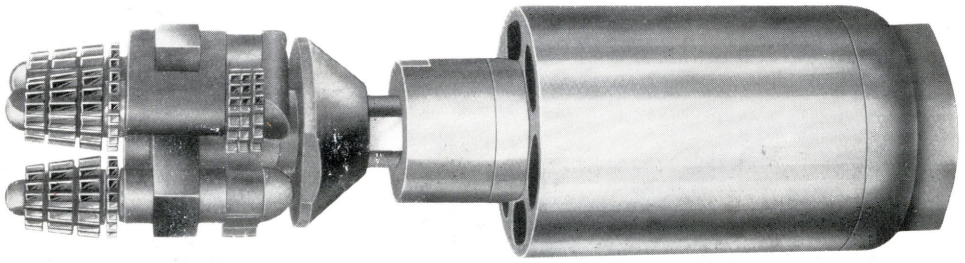
continued

THE cleaners illustrated on this page represent standard sizes of thrust-bearing water driven cleaners. Machines for curved tubes use a short bodied motor and a universal coupling for flexibility in negotiating the bends.



No. B.W251. Water Driven Thrust-Bearing Tube Cleaner for 3¼″ Bailey Water Wall Furnace Tubes.

Code Word : BJGXT



No. B96. Water Driven Thrust-Bearing Tube Cleaner for 4″ straight tubes.
No. B95 for 3½″ straight tubes very similar in appearance.

Code Word—No. B96 : CBBGD

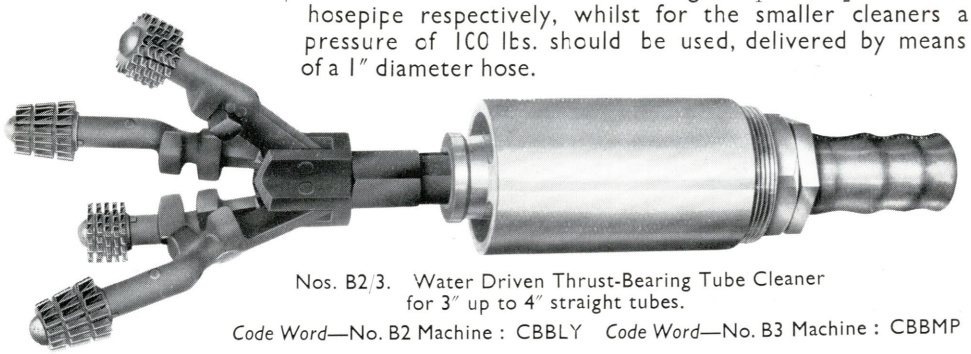
Code Word—No. B95 : CBBHM

Thrust-bearing Water driven Cleaners

THE illustrations on this page show yet a further type of water driven tube cleaner, the construction being both simple and sturdy. The body with integral bearing support is made of first class Admiralty gunmetal, and is arranged with one long hardened steel bushing, thus giving perfect alignment and even distribution of wear. The revolving turbine is also of Admiralty gunmetal, and is threaded on to the rear end of the centre shaft, in which position it balances the cutter head at the front end of the machine. The Rear Disc is screwed into the rear of the body and directs the water at the correct angle on the vanes of the revolving turbine. End thrust is taken by a removable steel washer, whilst bearing surfaces are water cooled and lubricated. Interior parts are easily removed from the rear end of the cleaner. Machines for 3″ up to 4″ tubes are equipped with a Four Arm Cutter Head having steel cone cutters and cutter wheels attached, in addition to the usual Universal Coupling with Arrow Head Drills for removing hard scale, and a liberal supply of cutters, pins, etc.

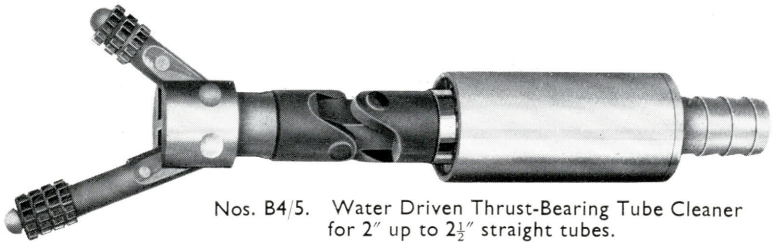
The Nos. 4/5 cleaners have steel bodies and are of similar construction. With each of these small machines, we include a Two Arm Cutter Head fitted with steel cutters, universal coupling, drills, and a complete set of replace parts for the head.

For maximum results, we recommend the use of 120 lbs. per square inch water pressure in the case of the Nos. 2/3 machines taken to the tool through a $1\frac{1}{4}$″ and $1\frac{1}{2}$″ diameter hosepipe respectively, whilst for the smaller cleaners a pressure of 100 lbs. should be used, delivered by means of a 1″ diameter hose.



Nos. B2/3. Water Driven Thrust-Bearing Tube Cleaner for 3″ up to 4″ straight tubes.

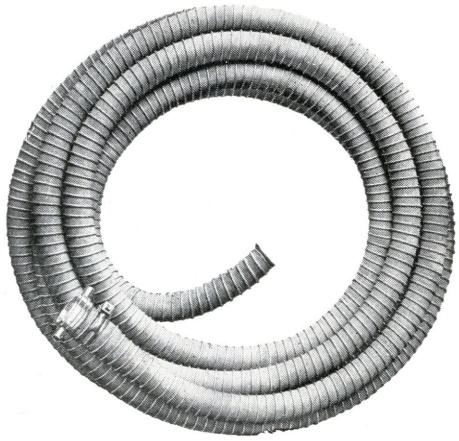
Code Word—No. B2 Machine : CBBLY *Code Word*—No. B3 Machine : CBBMP



Nos. B4/5. Water Driven Thrust-Bearing Tube Cleaner for 2″ up to $2\frac{1}{2}$″ straight tubes.

Code Word—No. B4 Machine : CBBJZ *Code Word*—No. B5 Machine : CBBKR

Armoured rubber hose for mechanical tube cleaning



Armoured Rubber Hose for Mechanical Tube Cleaner.

Standard Lengths, 40 feet and 50 feet

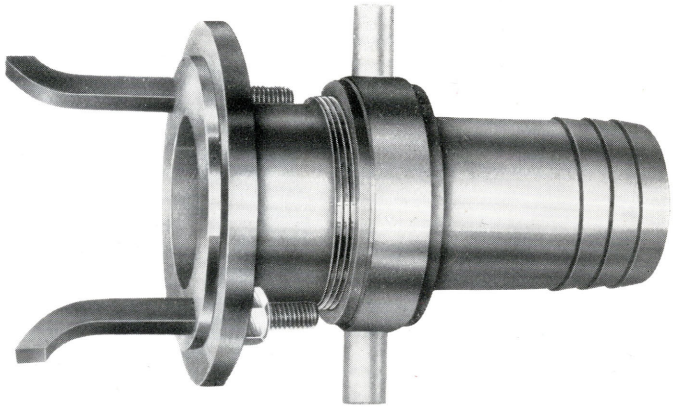
Size of Hose.	Length including coupling		Approximate Nett Weight		Code Words
	Feet.	Metres	Lbs.	Kilos.	
$\frac{3}{4}''$ diameter × 3-ply	40	12.19	29	12.70	CBBRI
	50	15.24	36	16.32	CBBSX
1″ diameter × 4-ply	40	12.19	33	14.96	CBBTO
	50	15.24	42	19.95	CBBVC
$1\frac{1}{4}''$ diameter × 4-ply	40	12.19	46	20.86	CBBWN
	50	15.24	60	27.21	CBBXU
$1\frac{1}{2}''$ diameter × 4-ply	40	12.19	55	24.94	CBBZW
	50	15.24	73	33.11	CBCBL

Pump Coupling ($1\frac{1}{2}$ in., 37·11 m/m., Female Swivel Half Union) Weight 2 lbs., ·91 kilos.
Code Word : CBBPA

Clamp for ditto ... ... Weight $\frac{1}{2}$ lb., ·23 kilos.
Code Word : CBBNJ

Drain attachment for water-driven Turbine Tube Cleaners

THE Drain Attachment, as illustrated, shows our standard fitting for round handholes. Similar attachment for oval or square holes can be supplied. These connections have been designed for conducting the waste water from the boiler after it has passed through the Cleaner, and it will be found most valuable where water has to be purchased, as the water can be used over and over again if drained to a sump or tank provided for the purpose. Canvas Hose, $2\frac{1}{2}''$ diameter (64m/m) is required.



Drain Attachment for Round Handholes. *Code Word :* CBCCI
,, ,, Oval Handholes. *Code Word :* CBCDU
,, ,, Square Handholes. *Code Word :* CBCFX

Directions for Fitting Drain Attachment to Round Handholes

The Drain Attachment is fitted at the back of the boiler to one of the handholes below the tubes to be cleaned. First, remove the handhole fitting, place the nozzle against the handhole, and insert the hook bolts from the inside of header, tightening up the nuts with a spanner. The canvas hose can then be coupled up. It will be found necessary also to remove the hand-hole fittings from the tube next to that on which the attachment is to be fitted, to admit the hand, but the handhole fittings must be replaced when the attachment is fixed, and before cleaning is commenced.

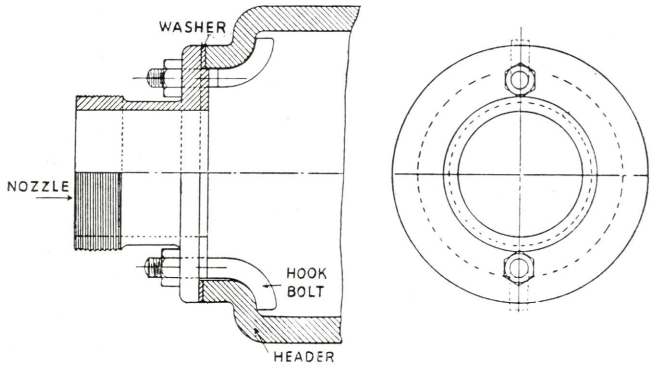


Fig. 2. Drain Attachment (Section and Plan).

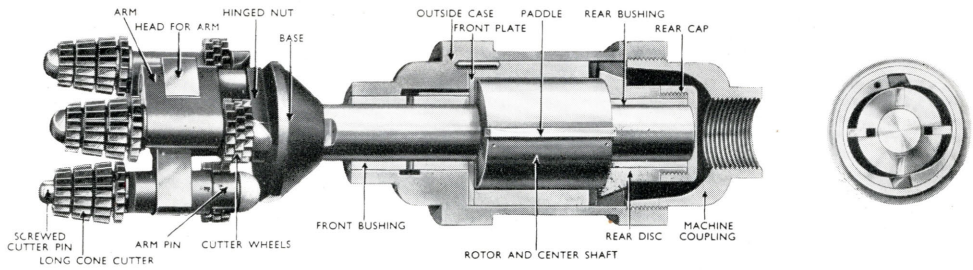
Air driven Cleaners

AIR Driven Cleaners are generally preferred to water driven machines by reason of their greater durability, faster work, convenience, and easy handling.

The design of these air driven cleaners is time tested, being ruggedly built to stand up under hard service, two of the four paddles in the centre shaft being always under pressure, thus stalling is practically impossible. The body is machined from solid steel with a long front bearing, whilst the paddles bear against a replaceable hardened steel front plate. Wearing parts are of special steel, tempered and ground to a thousandth of an inch accuracy, and all parts are interchangeable. The centre shafts are of one piece of steel. The motor is easily taken apart by removing the Quick Repair Cutter Head and unscrewing the machine coupling from the rear end, when the rear disc and centre shaft comes out at the rear.

These cleaners are equipped with Quick Repair Cutter Heads, Arrow Head Drills, Flat Drills or Porcupine Heads with Universal Coupling, and a complete set of replace parts for the cutter head as well as a spare set of four paddles for the centre shaft and rotor.

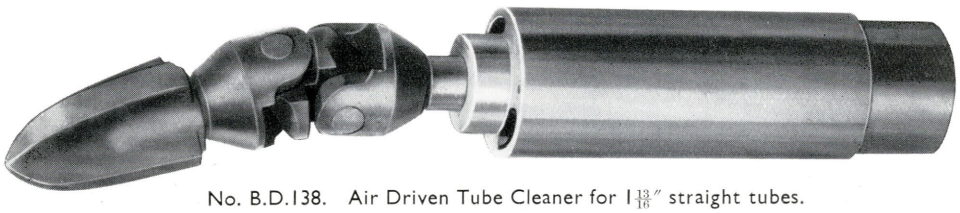
We recommend that these cleaners be operated with an air pressure of 80/100 lbs. per square inch. For large size machines a 1″ Hose should be used and a $\frac{3}{4}$″ Hose for smaller cleaners up to $2\frac{1}{2}$″.



Sectional view of Air Driven Cleaner fitted with Quick Repair Cutter Head.

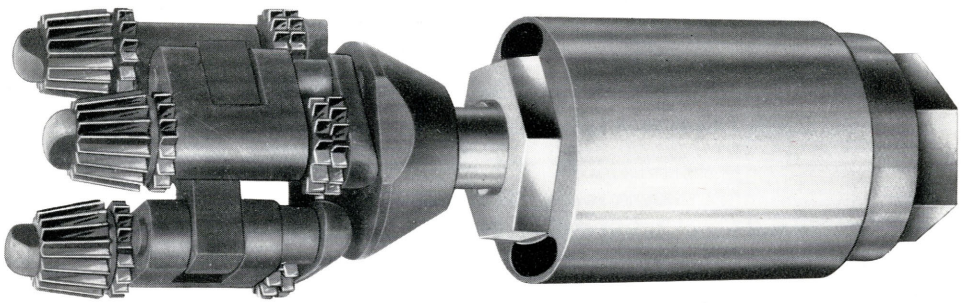
Representative Air driven Cleaners

THE illustrations on this page represent standard sizes of air driven cleaners for straight tubes. Intermediate sizes can be furnished on application.



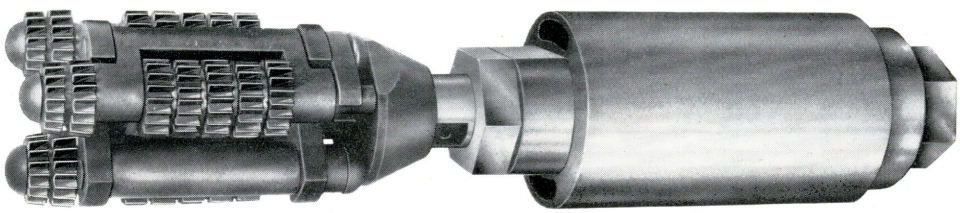
No. B.D.138. Air Driven Tube Cleaner for $1\frac{13}{16}''$ straight tubes.

Code Word : CBCGK



No. B.D.142. Air Driven Tube Cleaner for $3''$ straight tubes.

Code Word : CBCHS



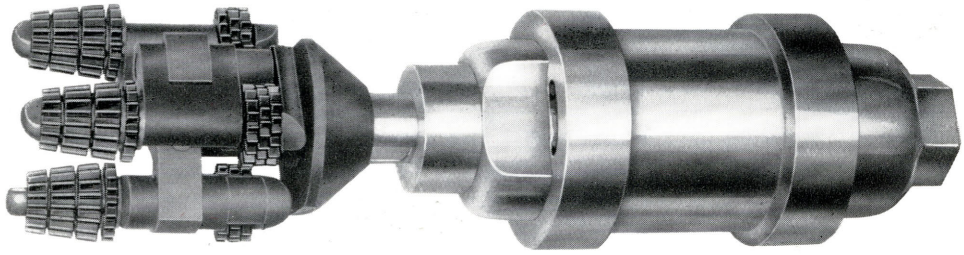
No. B.D.348. Air Driven Tube Cleaner for $3\frac{1}{4}''$ straight tubes.

Code Word : CBCJE

Representative Air driven Cleaners

continued

THE illustrations on this page represent standard sizes of air driven cleaners for straight tubes. Intermediate sizes can be furnished on application.

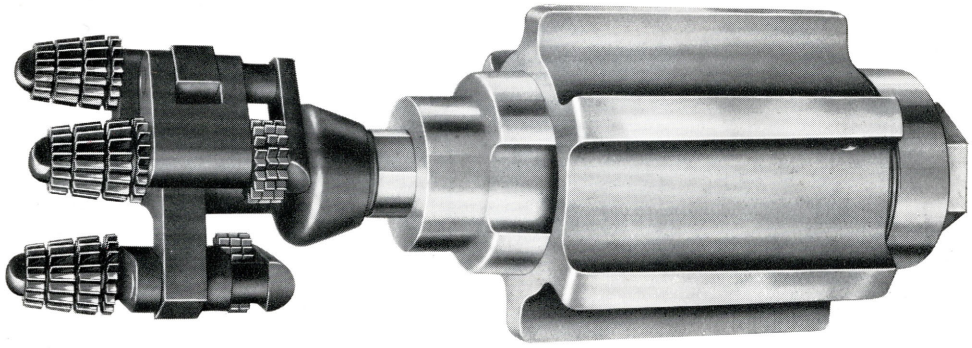


No. B81. Air Driven Tube Cleaner for 4″ straight tubes.

Code Word : CBCKW

No. B80. Air Driven Tube Cleaner for 3½″ straight tubes, very similar in appearance.

Code Word : CBCLV

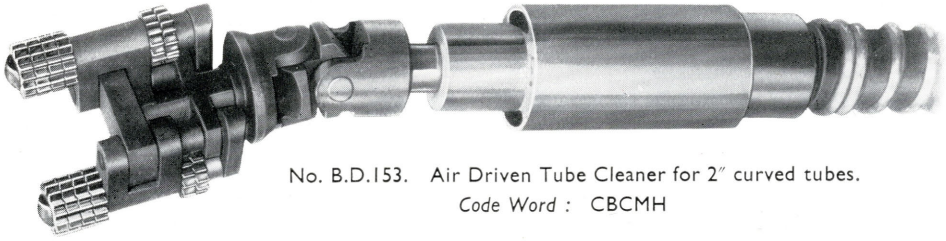


No. B.D.344. Air Driven Tube Cleaner for straight or curved tubes from 4″ up to 12″.

Representative Air driven Cleaners

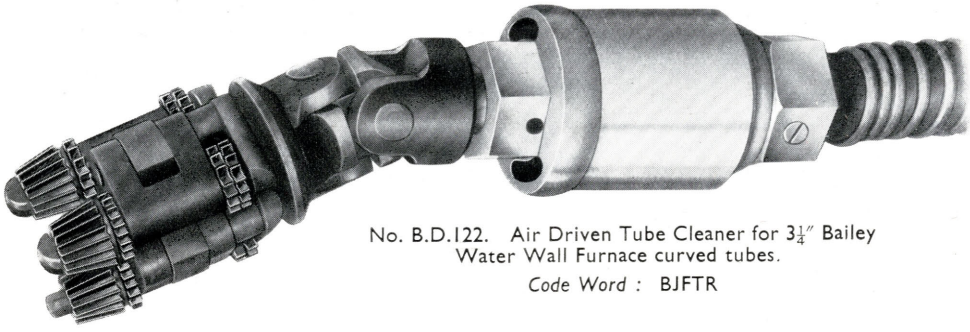
continued

THE illustrations on this page represent standard sizes of air driven cleaners for curved tubes. Intermediate sizes can be furnished on application.



No. B.D.153. Air Driven Tube Cleaner for 2″ curved tubes.
Code Word : CBCMH

No. B.79. Air Driven Tube Cleaner for $3\frac{1}{4}$″ Stirling curved tubes.
Code Word : CBCNC



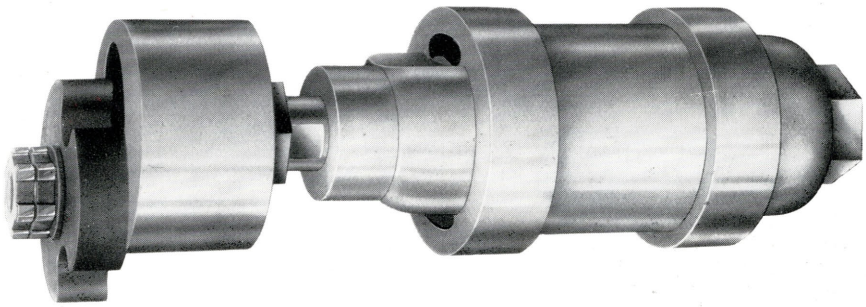
No. B.D.122. Air Driven Tube Cleaner for $3\frac{1}{4}$″ Bailey Water Wall Furnace curved tubes.
Code Word : BJFTR

Air driven Vibrator Cleaners for removing External Deposit

THE Air Driven Vibrator Tube Cleaner shown on this page will remove scale from the outside of fire-tubes by means of a localised vibration which effectively jars loose the inelastic scale. As the vibrator head is rotated, an arm is thrown from side to side and the clover-leaf knocker, turning freely, rains innumerable light taps around the circumference of the tube. The knocker has broad faces of the same curvature as the inside of the tube, so that although it delivers thousands of light, firm taps per minute, there is no possibility of its doing damage to the tubes, if the cleaner is operated with judgment. The blows struck are tangential and not direct thrusts at the tube.

The action of the Vibrator Cleaner being rotary, the operator does not have to turn or twist it in the tube, as is necessary with those types of cleaners which work in one plane only. The Vibrator Cleaner is operated with ordinary rubber hose—a big advantage over the use of a long, hot vibrating length of pipe,—at the same time requiring much less space in front of the boiler. To remove scale it is only necessary to feed the cleaner into the tubes and work it slowly back and forth. Scale can be removed much easier if the boiler is allowed to dry, as dry scale will crack and drop off the tubes more readily than scale that is wet. The vibration set up by the cleaner not only loosens and cracks off the scale from the outside of the tube, but it also removes soot from the inside, crushing and blowing it ahead of the machine.

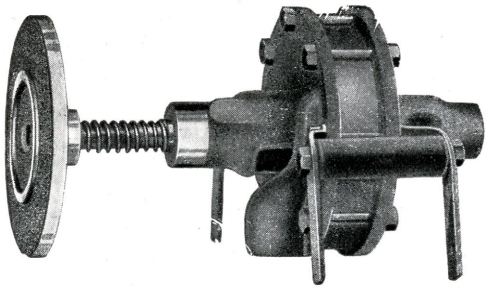
All vibrator cleaners are equipped with vibrator heads, universal coupling and arrow head drills. For removing certain types of scale and hard soot, the arrow head drill is sometimes preferable to the vibrator head.



Vibrator Air Driven Cleaner for 4″ O.D. Tubes		*Code Word* : CBCRA
,, ,,	3½″ O.D. Tubes	*Code Word* : CBCSZ
,, ,,	3″ O.D. Tubes	*Code Word* : CBCTB

Reseating machine for caps & headers

THE Reseating Machine is used for removing scale from the caps and headers of boilers having ground joints between the header and hand hole cap. The cleaner gives a perfect fitting steam and water tight joint with no possibility of nicking or scratching the faces.



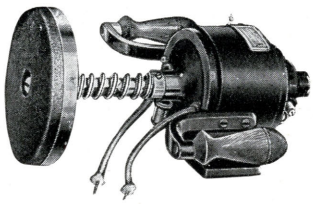
Air or Steam Driven Reseater.
Code Word : CBCVP

In operation, it is merely necessary to pass from tube to tube, holding the emery or carborundum cloth wheel against the cap seat for a moment. The grinding wheel is supported on a shaft by means of a spring so that the grinding is balanced and even though the operator may not hold the wheel exactly true against the header, the spring allows of enough play so that a uniform pressure is exerted and equal polishing obtained.

To assist in centring the grinding wheel, and to keep it from travelling off the cap seat, a guide ring is used,—shown in the illustration of the air or steam reseater at the top of this page.

When using the electric reseater to polish the faces of the caps, it is usually set in a vice, when the operator need only pick up the different caps and hold them for a moment against the face of the grinding wheel.

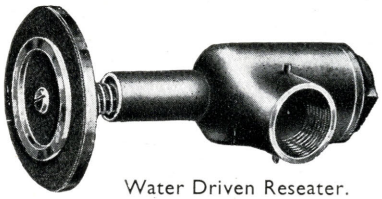
The Air or Steam Reseater is also a very popular type, which should be operated at an air or steam pressure of from 60/70 lbs. per square inch.



Electric Driven Reseater.
Code Word : CBCXR

Sight feed lubricator and grease cups are supplied for lubrication purposes.

The Water Driven Reseater is operated by a turbine motor similar to those employed in the turbine boiler tube cleaners. The turbine case is of phosphor bronze containing an inlet and outlet passage. Water at a pressure of 75 lbs. per square inch or more is supplied through the inlet with a $1\frac{1}{2}$" diameter hose. A 2" hose should be used at the outlet or exhaust passage, and a ten foot section is furnished with each machine.



Water Driven Reseater.
Code Word : CBCWM

In addition to the equipment mentioned above, each cleaner is fitted with an emery stone wheel, carborundum cloth plate with disc and guide ring, emery dresser, and a supply of spare carborundum discs.

Electrical Tube Cleaners

THE illustration on page 25 shows the Electrical Tube Cleaner which is designed for practically any size of tube, either straight or curved. The unit is driven by motors of from three-quarters up to three horse power, depending upon the nature of the work to be dealt with. Motors are semi-enclosed, continuously rated, ball bearing and fan cooled, and tested to B.S.S. Specification No. 170/1926.

A very strong well braced cast iron truck base with three steel wheels and device for slinging is provided upon which the motor and automatic push button overload and no volt release starter are mounted. In addition, remote control panel with push button switch and suitable length of four core cable can be supplied if required. D.C. Motors are fitted with hand operated semi-enclosed resistance Starters with overload and no volt release together with double pole totally enclosed switch fuse unit.

This remote control enables the operator to switch the motor ' On ' or ' Off ' from his position in front of the tube being cleaned without moving away from the work. This is a distinct advantage in the case of emergency, whilst apart from saving time, it also makes the unit capable of being operated by one man without the additional assistance of further labour to control the stopping and starting of the motor.

The flexible shaft is of heavy duty design, wound from 140/150 tons tensile spring steel wire, and suitable for heavy and intermittent loads. This shaft runs in a heavy flexible steel outer casing with interlocked joints into which is run asbestos cord thus effectively preventing oil leakage into the tubes, a most important feature. Each outer casing is reinforced internally with a strong spring closely wound helical liner, and in some cases is also fitted externally at either end with flat steel strip for a distance of 18".

The driving shaft may be between $\frac{5}{16}$" up to $\frac{3}{4}$" in diameter and of a length up to 50 ft., depending upon the type of installation to be dealt with. Connections of the flexible shafting to the motor and cleaning tools are effected respectively by a splined adaptor and ' Hoffman ' ball and roller or thrust bearing handles. Provision for lubrication is made in the handle.

With each unit is included either the Quick Repair type Cutter Head of the Two, Three or Four Arm design which is operated at approximately 1500 r.p.m., or alternatively graded Flat type Heads for a speed of 2800 r.p.m., all of suitable dimensions for the particular conditions.

Electrical Tube Cleaners

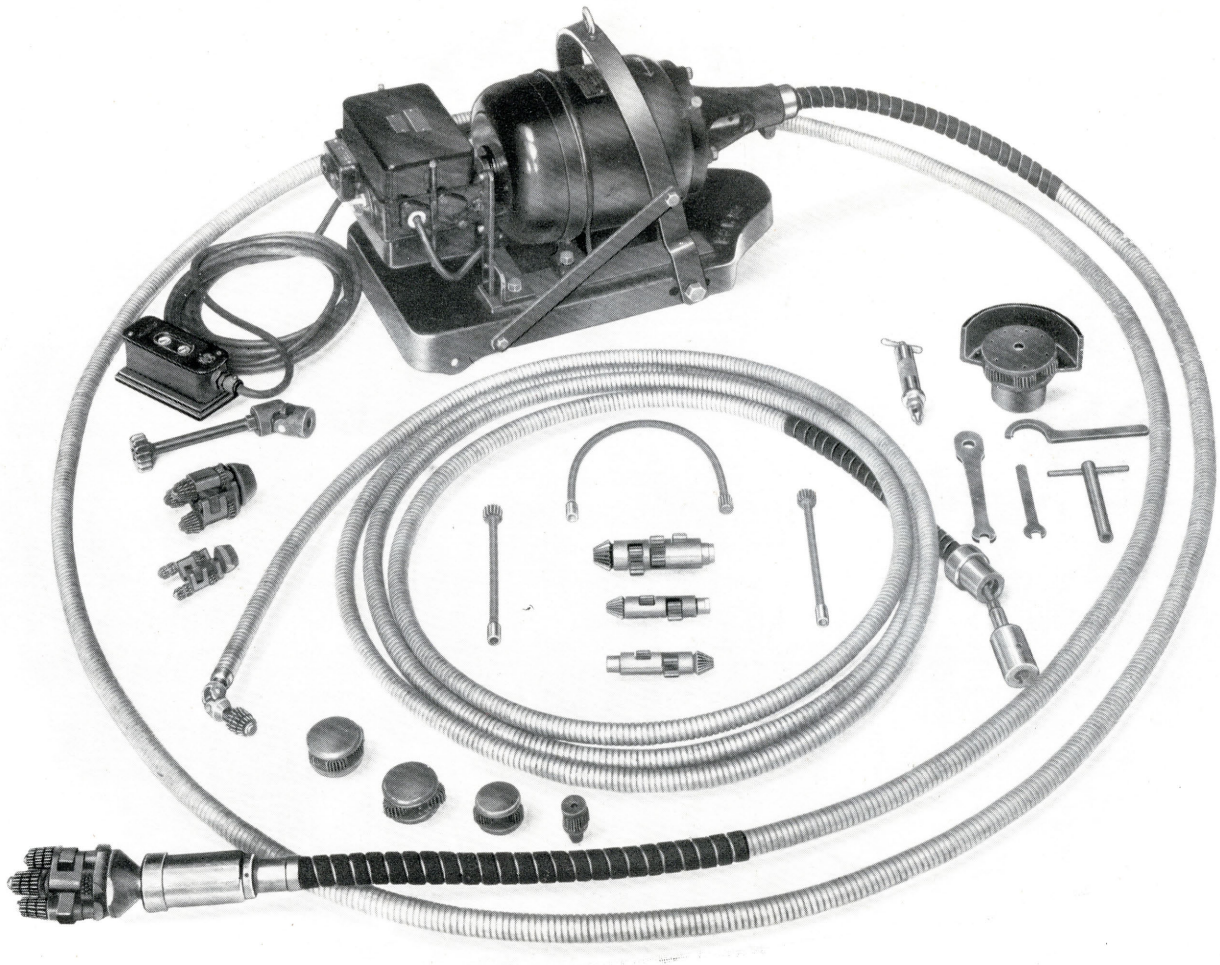
continued

A further head included is the Knocker Tool, which is recommended for the initial breaking up of hard deposit prior to the use of the Cutter Heads. The correct size of cleaning head to use is the largest which can be passed through the tube to be cleaned with both flexible shaft and head stationary.

In operation the cleaning tool should be passed down the tube until same is flush with the bell mouth at the lower end of the tube. A mark should then be placed on the casing level with the bell mouth of the upper end of the tube, and this will prevent the cutter being completely passed through the tubes as damage may be caused if this precaution is not adopted. In addition, it is necessary in all tube scaling work, if the best results are to be obtained, to see that a small flow of water should be kept passing through the tube whenever the cleaning head is at work. This helps to keep the cutters and bearing parts cool and carries away the loose deposit.

All enquiries for this class of equipment should give the following :—

1. Type of Boiler or Installation to be dealt with.
2. Outside diameter and wall thickness of the tubes.
3. Maximum length of tubes.
4. Nature of scale conditions.
5. Full details of electricity supply.



Babcock & Wilcox Standard Electric Tube Cleaner showing various cleaning heads available.

Twin-drive Electric Tube Cleaner

THIS machine is particularly recommended where a high rate of scaling is required and where two different Installations are to be dealt with at the same time, but if necessary, one flexible shaft only may be used.

Motor is fitted with integral gear box having two spindles running at different speeds, one a high speed for dealing with small diameter tubes such as Condensers, Evaporators, etc., and the other a low speed for scaling Boiler and Economiser tubes. The usual standards are 3,000 r.p.m. high speed and 1,500 r.p.m. for low speed, although the motor may be supplied in all speeds and voltages.

Gears are enclosed in a cast iron box substantially ribbed and an arrangement of oil thrower, oil resistance washer and steel bearing cover prevents leakage of oil.

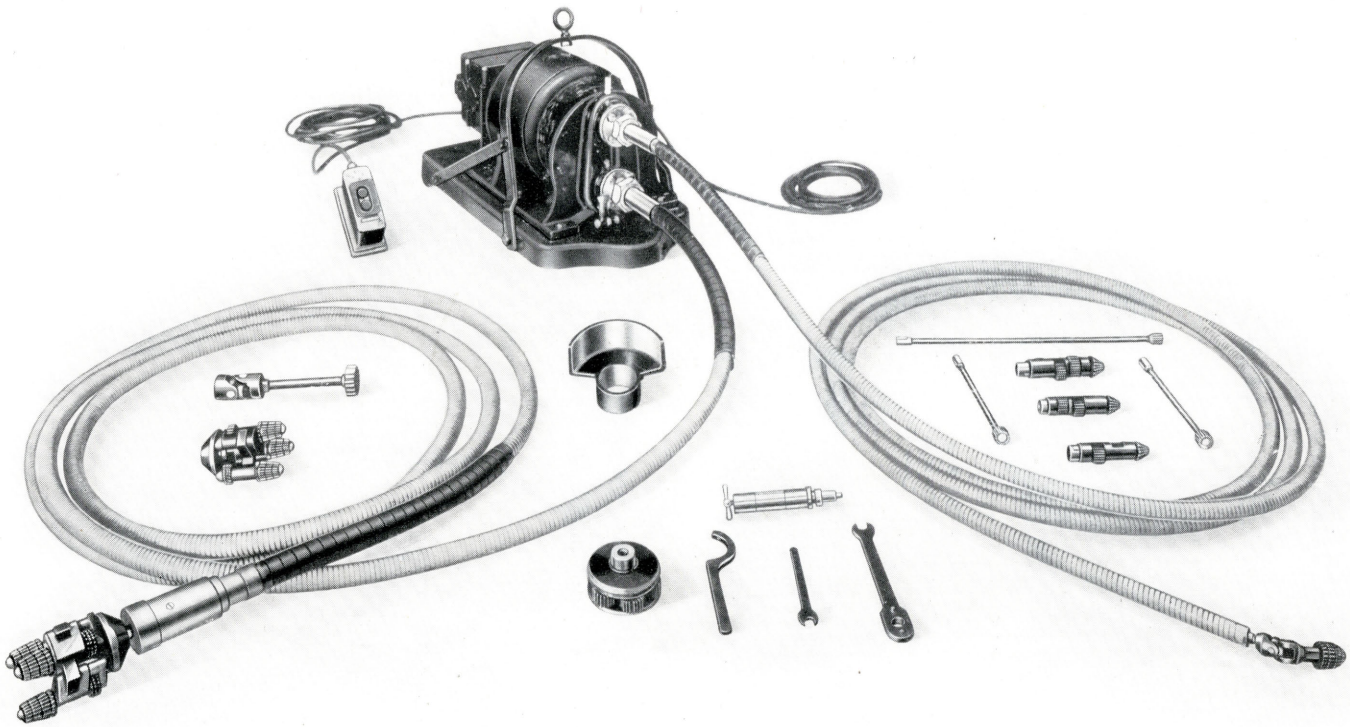
An external oil level gauge is provided.

The gear box spindles have squared ends and are manufactured from Nickel Steel heat treated and precision ground after treatment. Ball and roller bearings are used throughout and the low speed spindle is equipped with special large bearings.

Flexible shafts are readily detached from the motor by merely unscrewing the large hexagon Gunmetal Adaptors provided.

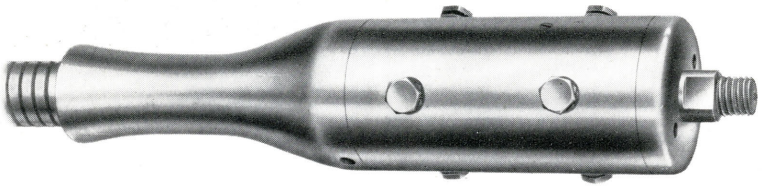
A.C. motors are equipped with Automatic push button direct on line Starters fitted with no volt and overload releases as well as remote control panel and cable. D.C. Units have hand operated semi-enclosed resistance Starters with overload and no volt releases in addition to a double pole totally enclosed switch fuse unit.

A second type of machine similar to the above is also manufactured having both spindles running at the same speed, thus enabling two flexible shafts to be operated at the same time on the same work. This Unit is provided in cases where scaling is to be speeded up and where it is necessary to have two operators working at the same time.

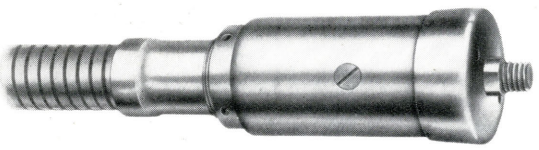


Babcock & Wilcox Twin Drive Electric Tube Cleaner fitted with integral gear box and two flexible shafts.

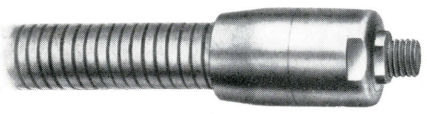
Accessories for Electrical Tube Cleaner



Heavy Duty Ball and Roller Bearing Handle No. 4.
For straight tubes of all sizes from approx. $2\frac{3}{4}$" up to 4"
Code Word : CBCZD



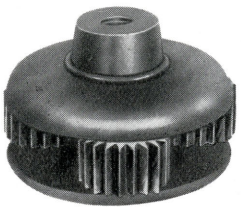
Standard No. 3 Ball and Roller Bearing Handle. For straight tubes of all sizes from $2\frac{1}{2}$" up to 4"
Code Word : CBDBM



Short Thrust Bearing Handle No. 2. For straight or curved tubes.
Code Word : CBDCV

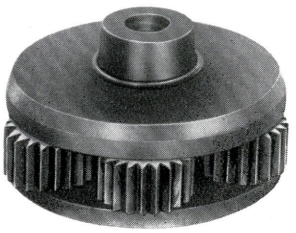
Small Diameter Thrust Bearing Handle No. 1. For straight tubes.
Code Word : CBDDH

Plain End Thrust Bearing Handle No. 0.
For small, straight or curved tubes.
Code Word : CBDFO



Flat Type Cutter Head, graded in $\frac{1}{8}$" sizes.

Flat Type Six Cutter Head for surface scaling.



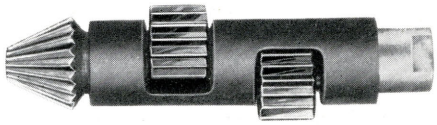
Accessories for Electrical Tube Cleaner

continued

Boring Tool.

Made in sizes :—

$1\frac{1}{8}''$	—	$1\frac{1}{2}''$	*Code Word :* CBDND
$1\frac{5}{16}''$	—	$1\frac{11}{16}''$	*Code Word :* CBDPJ
$1\frac{9}{16}''$	—	$2\frac{1}{16}''$	*Code Word :* CBDRF
$1\frac{7}{8}''$	—	$2\frac{1}{2}''$	*Code Word :* CBDSB



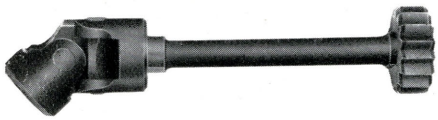
Handle Guard for Surface Scaling Head.

Flat Type Cutter Head for small diameter brass or copper tubes

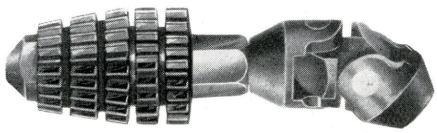
Single Pin Cutter Head for small diameter brass or copper tubes.

Superheater Extension Piece.
Code Word : CBDHP

Flexible Knocker Tool for breaking up hard scale in small tubes.
Code Word : CBDGT



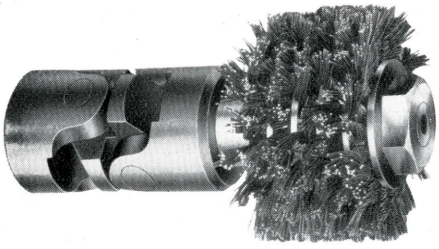
Heavy Duty Knocker Tool for breaking up hard scale in boiler tubes.
Code Word : CBDJL



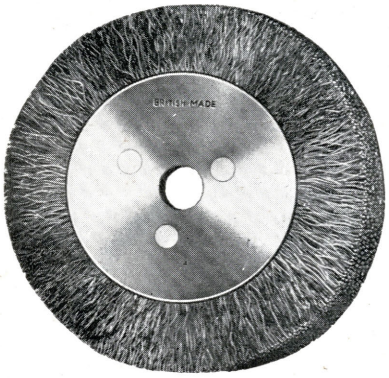
Single Pin Cutter Head for small diameter tubes.
Code Word : CBDKZ

Accessories for Electrical Tube Cleaner

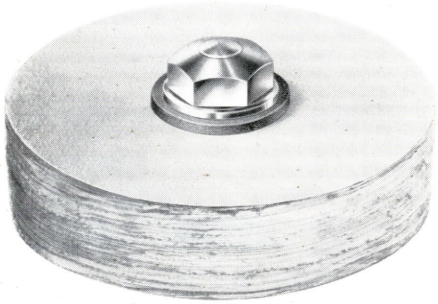
continued



Boiler tube brush for removal of soft scale and internal polishing of tubes.
Code Word : CFBHG



Surface Scaling Brush recommended for the removal of rust, paint, etc.
Code Word : CFBJS



Calico or Linen Mops for polishing stainless steel, brass or copper tubes and surfaces. These mops may be supplied with a suitable cleansing agent.
Code Word : CFBKL

Small diameter brush for Condensers, Evaporators, etc.
Code Word : CFBLX

In addition to the above attachments, we can also furnish Emery Stone Wheels and Carborundum Cloth Discs for the purpose of regrinding, facing up and reseating caps and headers.

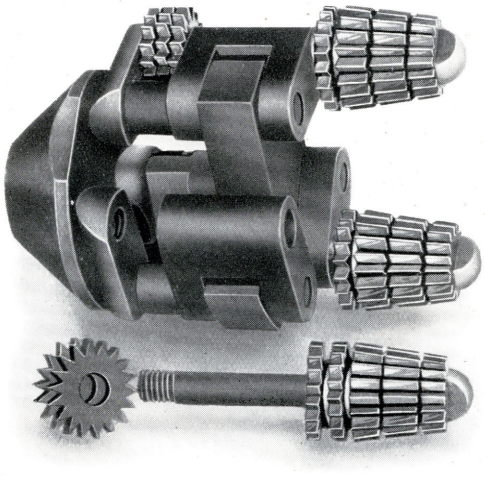
Various Quick Repair Cutter Heads, Arrow Head Drills and Universal Couplings

THE illustrations on previous pages show the use of several types and sizes of cutter heads. These are all constructed on the Quick Repair design which has stood the test of service for many years. These heads are very effective in service, and the illustration at the foot of this page shows how easily and quickly they may be taken apart for replacing cutters, only a wrench being required.

Construction is very simple and rugged. Cutters are carefully heat treated and hardened so that they have the correct degree of hardness and yet are tough enough to stand up under hard service.

In operation, the Quick Repair Head swings out under centrifugal force to the full diameter of the tube, but yielding should a constricted portion be encountered. These heads are very strong, and no rivets, cotter pins, trunnions or other small, complicated parts are used. The Head for Arm is milled from a solid bar of steel and carefully hardened, as are also the arms.

In cleaning straight tubes, the cutter head is attached direct to the shaft of the cleaner, whilst for curved tubes it is used with the intermediary of a Universal Coupling. These heads are built in sizes from 2″ to 12″.



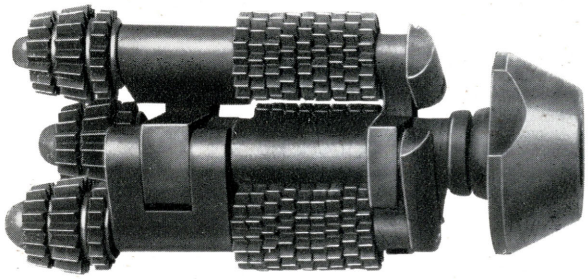
Quick Repair Cutter Head, partially dismantled.

Arrow Head Drills, Flat Drills and Porcupine Heads, as illustrated, are used with Universal Couplings for removing heavy and hard scale. They strike a light, tangential blow which both crushes and knocks out the scale, yet does not injure the tube. Where scale is brittle and cracks off cleanly, they will do the entire cleaning, but if the scale is chalky and adheres to the tubes cleaning should be finished with the Quick Repair Head.

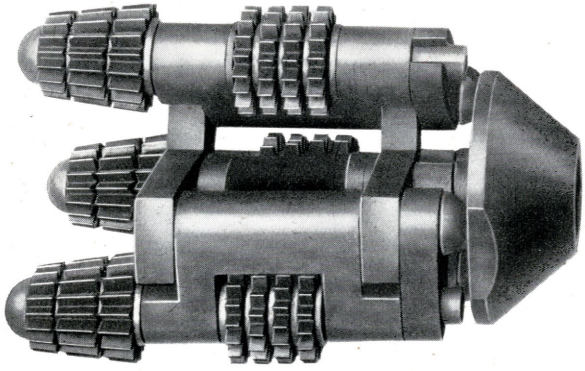
When dealing with large size tubes an Extension Piece is used between the Universal Coupling and Arrow Head Drill, thus increasing the cutting range of the Drill.

Various Quick Repair Cutter Heads, Arrow Head Drills and Universal Couplings

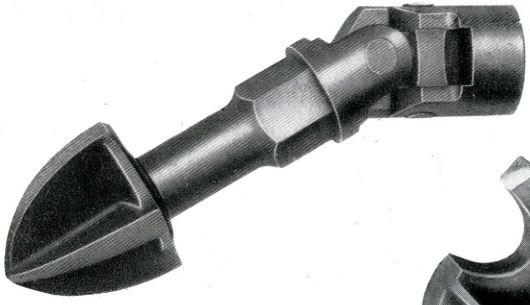
continued



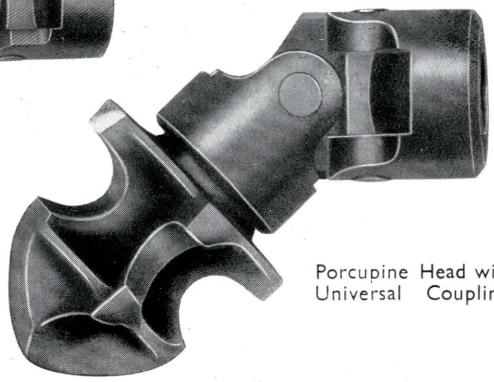
Long-Surface
Quick Repair Cutter Head.



Medium Surface Slotted Clip
Cutter Head.



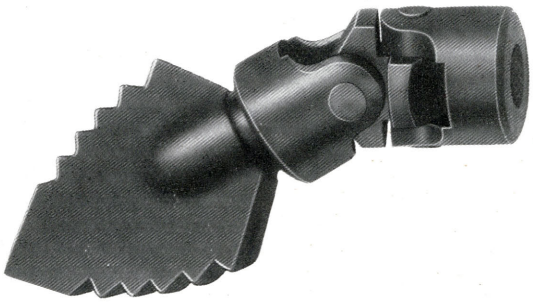
Extension Piece used between Universal Coupling and drill. Increases the cutting range of drill in large size tubes.



Porcupine Head with
Universal Coupling.

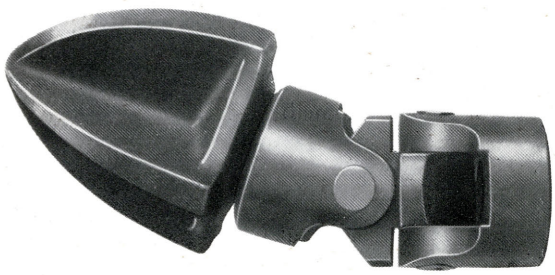
Various Quick Repair Cutter Heads, Arrow Head Drills and Universal Couplings

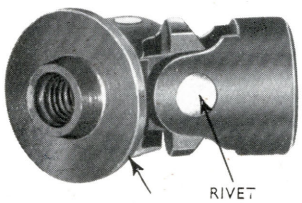
continued

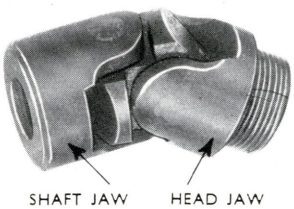


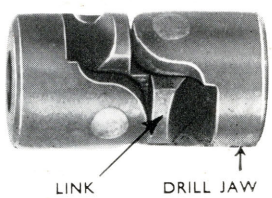
Flat Drill with Universal Coupling.

Arrow Head Drill with Universal Coupling.





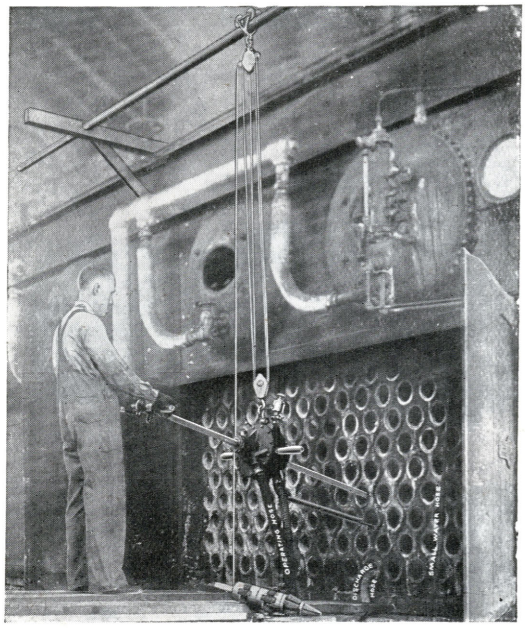




Three types of Universal Couplings, showing names of parts.

Centre drive direct steam motor tube cleaner for straight tubes

THE Centre-Drive Direct Steam Motor Cleaner, illustrated, is recommended for plants where the tubes have become heavily encrusted with scale, and where it is necessary to remove the deposit quickly. The use of this cleaner greatly reduces the time that a boiler is out of commission, as on an average it will do the work in one third the time that the usual tube cleaner requires. Many large power plants have found that the use of this type of cleaner reduces the cost of cleaning, and as a rule it will prove to be the best proposition where the machine must be kept in constant use. Substantially and heavily built, these machines will outlast three or four turbine type tube cleaners.



Centre Drive Direct Motor Cleaner at work.

This cleaner consists of a very powerful steam driven motor, which remains stationary at the front of the boiler and drives a solid steel shaft and cutter head which enters the tube. Although the motor is comparatively large and heavy, it is very easy to handle as it is suspended by a block and tackle hanging from an overhead pulley, which work across the front of the boiler. The motor can be raised or lowered to centre it for each row of tubes, and the operator does not have to bear any weight of the cleaner.

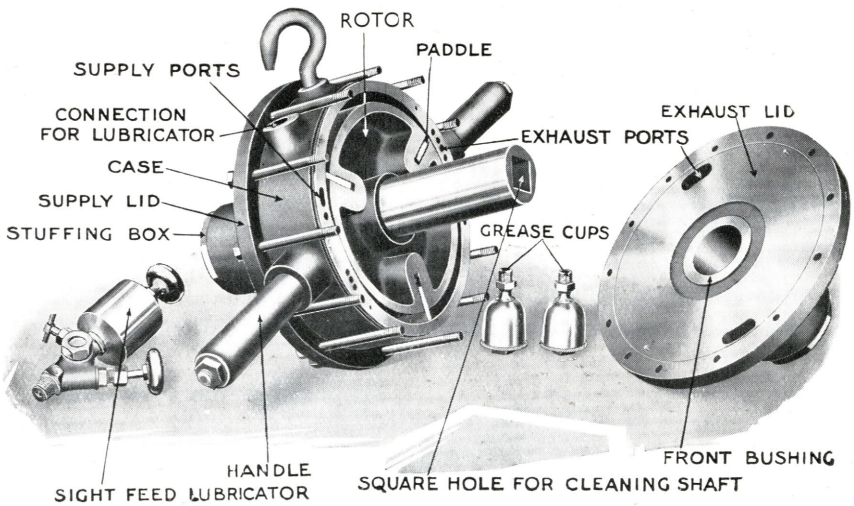
The square shaft passes through the motor, which keeps revolving at the correct speed while the operator pushes the shafting and cutter head into the tube. The shaft revolves in a bronze bearing in the handle, permitting any desired pressure to be exerted. The shaft can be made in two or more lengths depending upon the amount of space available in front of the boiler. Each length has a snap trigger coupling, allowing sections to be coupled together very quickly.

The construction of the centre-drive motor is illustrated on page 35.

The rotor is nine inches in diameter and with a steam pressure of 100 lbs. per square inch, the motor develops from 5 to 10 H.P. depending upon the power and speed required.

Steam motor tube cleaner for straight tubes

continued

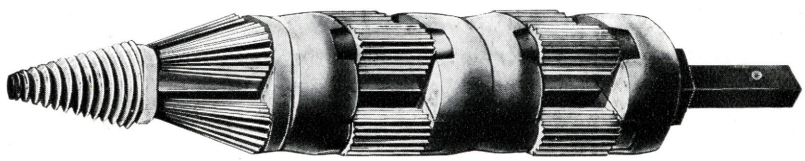


Disassembled view of Motor. *Code Word :* CBDLU

Steam is admitted through ports in the rear cover and after expending its energy on the paddles of the rotor, is exhausted through ports in the front cover. All bearings in the motor are exceptionally heavy and bushed with first class bearing bronze. The motor is lubricated by a sight feed lubricator at the top of the case and grease cups on front and rear bearings. The Cutter Head consists of a screw point followed by a series of cone and cylinder cutters. Each cutter wheel is on a separate pin and is free to revolve independently of the others. The complete equipment furnished includes lubricators, oil cups, suitable lengths of shafting, two cutter heads, adjustable block and tackle with trolley, and a liberal supply of cutters, pins, etc.

In using this machine, a stream of water should be introduced into the tube by means of a small hose, placed in the front of the tube, in order to cool the cutters and wash away the scale removed.

We recommend that saturated steam only be used with this cleaner, as superheated steam burns up the oil very quickly and makes the question of lubrication a difficult one.



Cutter Head used on Centre-Drive Cleaner. *Code Word :* CBDMG

Hand Cleaning Tube Cleaners

WHILST in the majority of cases the cleaning of boilers is accomplished by power driven tools, yet it frequently happens that conditions may exist in a boiler house where power is not available, so that hand driven cleaners must be resorted to. The following pages give an account of the tools which have been specifically designed for such circumstances.

In the ordinary course of events, whilst power driven tools enable the boiler to be cleaned more quickly, yet the hand driven tools, whilst possibly necessitating a longer time to effectively clean the boiler, will enable this operation to be performed satisfactorily and at a cost little in excess of power driven machines.

The illustrations opposite show the various forms of hand-cleaning tools we use. The scraper Fig. 1 answers perfectly for light scale, and even moderately hard scale. The forms Figs. 2, 3 and 4 are used where hard scale has to be removed. To each of these tools a handle is required to be fitted.

To Fig. 4 scraper a length of wrought iron tubing, screwed $\frac{3}{4}''$ gas thread, is required, which in turn should be connected to a water supply by means of a rubber hose for conveying a small stream of water through the centre of the tool, in order to cool the cutters and wash away the scale removed by the scraper. A valve can be fixed between the wrought iron tubing and the hose for regulating the water supply.

The caps at the front and rear of the boiler tubes are removed, and the scraper pushed through. The incrustation thus broken off is removed from the rear-headers of the boiler.

Tube Scrapers

Fig. 1

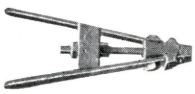


Fig. 2

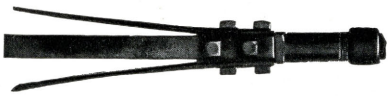


Fig. 3

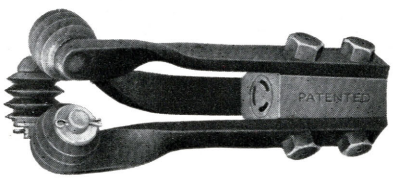


Fig. 4.

Diameter of Tubes for which Scrapers are suitable.	CODE WORDS			
	Fig. 1.	Fig. 2.	Fig. 3.	Fig. 4.
4 inch	CBDTN	CBDVK	CBDWC	CBDXX
Nett Weight { lbs. / kilos	$2\frac{3}{4}$ / 1.25	$2\frac{1}{4}$ / 1.0	6 / 2.72	5 / 2.26

Tube Brushes

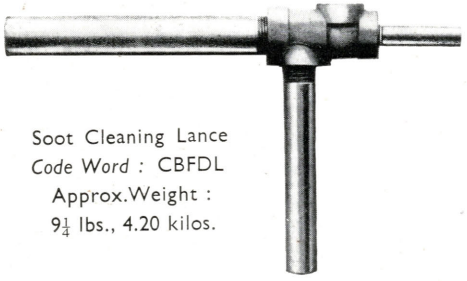
For 4-inch Tubes. *Code Word:* CBDZE
Weight 2½ lbs. ; 1.14 kilos.

THIS brush is made of strong steel bands and is very satisfactory both for brushing out and removing light scale from boiler tubes. It is stronger than the ordinary wire brush and will be found more economical in the long run.

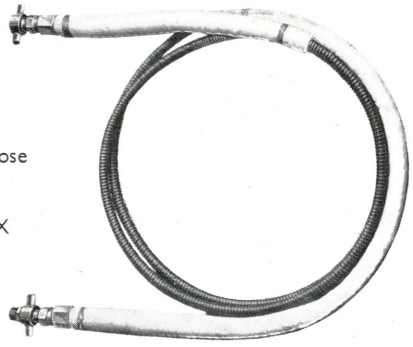
Similar brushes can be supplied for small condenser and other tubes.

When ordering, the internal diameter of the tubes to be cleaned should be stated.

Steam Soot Cleaning Lance and Hose



Soot Cleaning Lance
Code Word : CBFDL
Approx.Weight :
9¼ lbs., 4.20 kilos.



Flexible Metallic Hose
(with couplings)
½" 12.7 mm., dia.
Code Word : CBFBX

Standard length, for all boilers, 16 ft.
Approx. Weight, 14 lbs., 6.35 kilos.

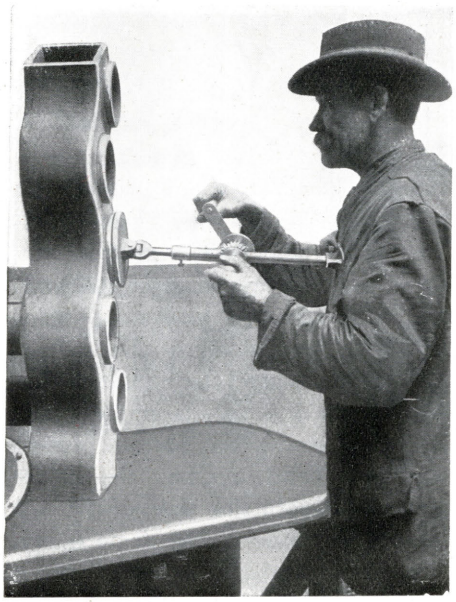
For installations where the width of the passageway is restricted we can supply a Knuckle-jointed Cleaning Lance. *Code Word* : CBFCD

Hose suitable for steam pressures up to 300 lbs.

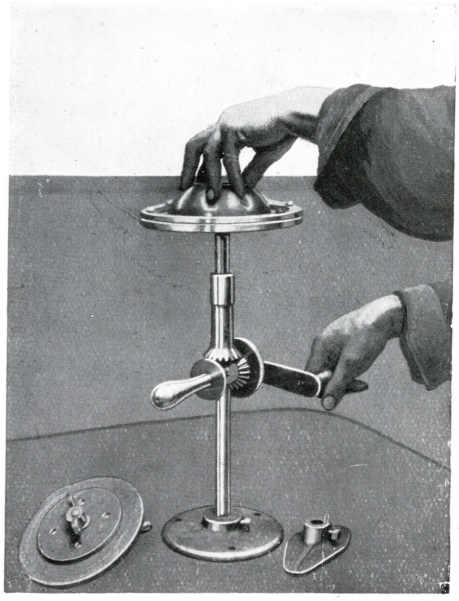
Hand Machine for cleaning Handhole Fittings

(For No. 10 Headers)

For External Fittings



Application of Machine when cleaning handholes of headers.



Application of Machine when cleaning cap or nut.

THE above illustrations show the method of using the Hand cleaning Machine for Header Faces and Caps. The tool comprises a geared hand machine fitted with revolving discs faced with emery cloth. The left-hand illustration shows the application of the machine when cleaning the handholes of a header, the machine in this instance being fitted at one end with a revolving disc and universal joint attachment, and at the other end with a breast plate. The universal joint allows the revolving disc to exert an even pressure on the faces of the header, no matter at what angle the man operating the machine may stand, thus ensuring true and clean surfaces.

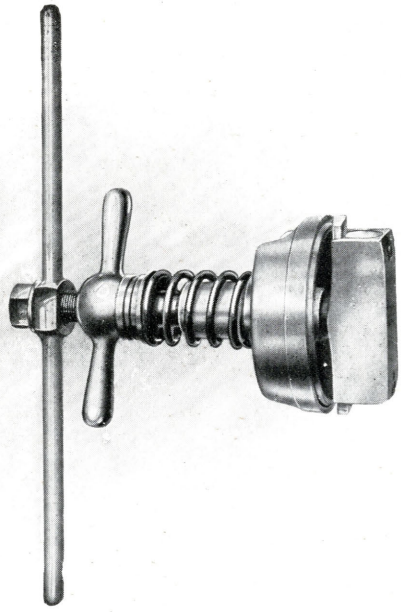
The method of cleaning the cap or nut belonging to the handhole fitting is shown by the right-hand illustration. The breast plate being detached from the machine, the end of the spindle is inserted into the cast base plate, which should be bolted or screwed to a bench. The disc, fitted with universal joint, is also removed, and a disc with a fixed spindle is fitted in its place. The cap or nut is held against the revolving disc., which immediately cleans up the jointing surface.

Code Word for Hand Machine : CBFFS

The weight of the Machine is 18 *lbs.* (8 *kilos*) *unpacked.*

Hand Cleaning Machine

(For No. 23a Headers) For Internal Fittings



View of New Hand Cleaning Machine ready for Operating.

THIS illustration shows a Babcock & Wilcox Hand Cleaning Machine for the internal faces of Nos. 23a Headers.

The tool comprises a steel casting on which are mounted two cutters, each in a holder fitted with guide roller. The cutter holders are pressed outwards by a spring arranged between them, the outward movement being limited by pins sliding in the casting. One end of the steel casting is extended in the form of a spindle which passes through a sleeve, the bottom portion of which forms a clamp shaped for engagement with the wall of the oval hole in the header. The clamp cannot turn, being of the same oval shape as the handhole. Apertures are provided in this clamp to enable the operator to follow the working of the cutters. The upper end of the spindle is provided with a screw thread, wing nut and compression spring to tighten the clamp to the header. The cutters are pressed against the surface to be cleaned by the internal and external springs already referred to. The tool is rotated by a handle or "tommy" bar, which fits the squared end of the spindle.

Method of Operating Tool

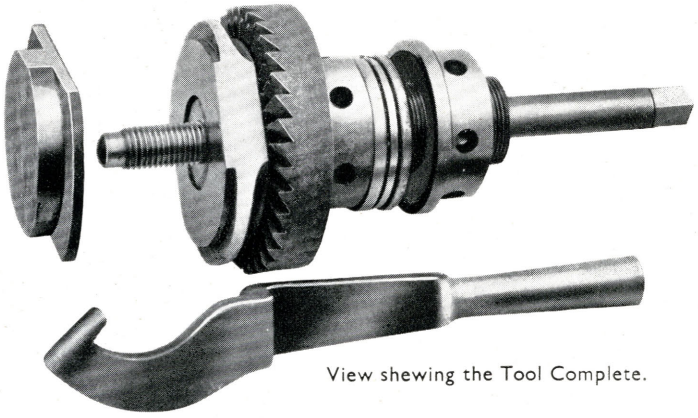
Loosen wing nut and insert rectangular box into handhole. Draw tool back to bring guide rollers into such a position that they track inner wall of hole. Screw down wing nut which brings cutters into position for cleaning and at the same time tightens up the clamp. The tool is then rotated by means of the handle.

Code word for complete machine for 4 in. Tubes : CBFGJ
Approx. Nett Weight : 12 lbs. ; 5.5 kilos

Code word for complete machine for $3\frac{1}{4}$ in. Tubes : CBFHB
Approx. Nett Weight : $9\frac{1}{2}$ lbs. ; 4.30 kilos.

Hand Milling Tool for Facing Handholes of Headers, complete with Spanner

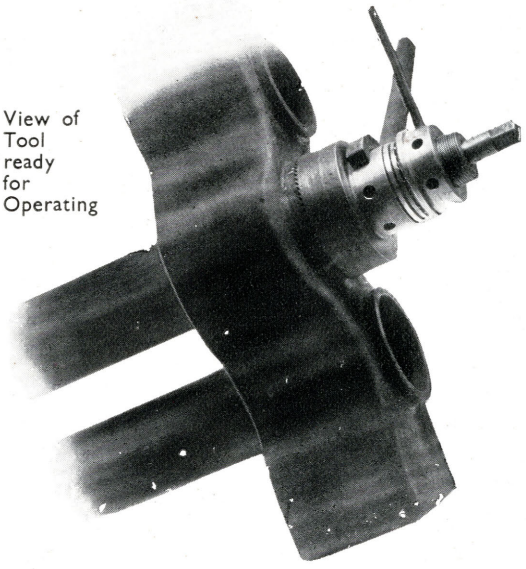
(For Wrought Steel No. 10 Headers)



View shewing the Tool Complete.

THE Hand Milling Tool, as illustrated, is self-contained and self-centreing, and its use only entails the removal of one hand-hole fitting.

The method of operating this tool is as follows : Place the bearing plate inside the header over the end of tube : remove cutter-head, thrust washer and feed nut ; insert body-piece with centre spindle, and screw-back ; set up centre spindle to bearing plate hand-tight ; replace cutter-head, thrust washer, and feed nut on body-piece, setting all fair by hand ; then screw up centre-spindle tight, and operate by lug-spanner.



View of Tool ready for Operating

Before applying this tool to the handhole facing and to ensure that it will grip the facing instantly when applied, it is recommended that the glass surface of the facing be roughened slightly by means of a smooth file.

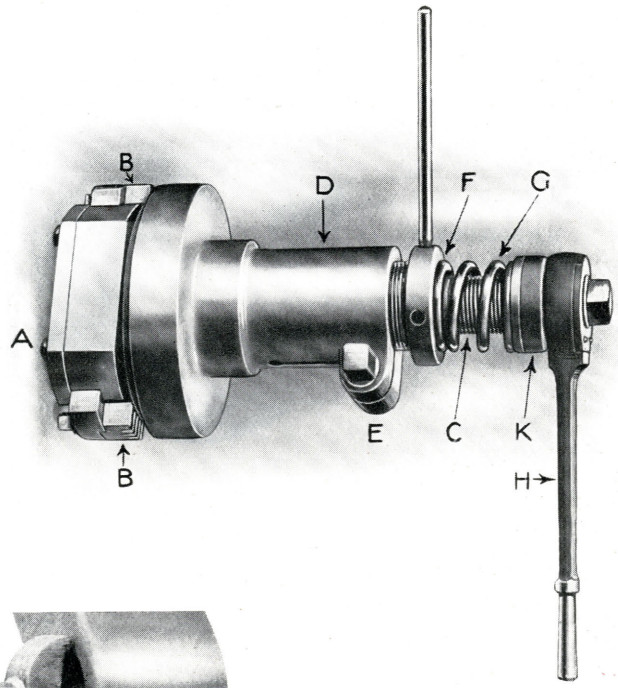
This tool can be operated by a ratchet if preferred.

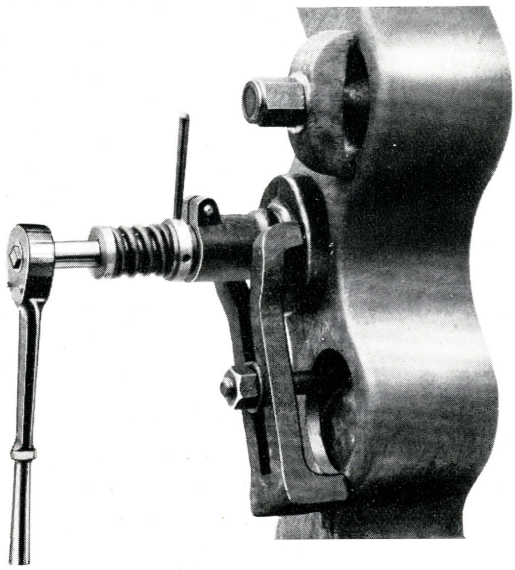
For 4 in. Tubes. Approx. Nett Weight—lbs. 36 ; kilos 16.32. *Code Word :* CBGBH

Hand Milling Tool for Facing No. 23a Handholes of Headers

(For Internal Fittings)

View of
Hand Milling Tool.





View of
Hand Milling Tool
arranged ready for
Operating.

Hand Milling Tool for Facing No. 23a Handholes of Headers, complete with Ratchet and Steadying Bracket

continued

(For Internal Fittings)

Description

THE illustrations on page 42 show a Babcock & Wilcox Hand Milling Tool for dealing with the internal faces of No. 23a Headers, and the method of its application.

The tool comprises a steel Casting A known as the holder, on which are mounted two Cutters B free to slide in an outward direction. The holder is formed with an extended Spindle C, on which is mounted a casing D, the base of which is formed to fit into the handholes of the header, and is also provided with an internal cam which controls and guides the movement of the Cutters B. This casing D is provided with a Clip Head E for easy release of the Gland F screwed into it, and which is incorporated for the purpose of compressing the spring G, which exerts the necessary pressure to bring the Cutters B up to their work. This spring is kept in position by Collar K and the upper end of the Spindle C is provided with a square head on which the Ratchet H is fitted for operation of the tool.

Method of Operating Tool

Slacken clip joint ' E ' on casing ' D ' and rotate gland ' F ' so that the spindle ' C ' moves through casing ' D ' until the distance between the cutters ' B ' and the facing on casing ' D ' is greater than the thickness of the wall of the header. Rotate the tool holder ' A ' until the rollers which control cutters ' B ' are on the minor axis of the cam on the underside of the casing. Insert tool holder with rollers still engaged in the cams, through the handhole (the tool holder passes through the major axis of the handhole), adjust gland ' F ' so that the cutters engage on the facing. Tighten clip ' E ' sufficiently to prevent gland ' F ' turning (gland ' F ' controls the amount of feed). Rotate the tool by means of ratchet handle ' H ' and the cutters will commence to re-face the handhole. Continue until the desired result is obtained feeding when necessary by means of gland ' F.'

Hand Milling Tools for Superheater Boxes

$3\frac{5}{8}''$ Square and $4\frac{11}{16}''$ Square

(Internal Faces)

Description

These tools are generally of similar design to the tool illustrated on page 42 and should be operated in a similar manner with the exception that for inserting the cutters into the handhole the tool holder requires to be rotated until the rollers are midway along the cam on the underside of the casing. The tool holder may then be inserted through the diagonally opposite corners of the handhole.

Full description and method of operation are given on page 43.

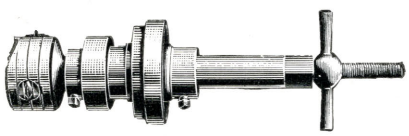
Tool for faces $3\frac{5}{8}''$ square complete with ratchet
Approximate nett weight, 21 lbs.
Approximate nett weight, 9.52 kilos.

Code Word : CBFJR

Tool for $4\frac{11}{16}''$ square faces complete with ratchet
Approximate nett weight, 27 lbs.
Approximate nett weight, 12 kilos.

Code Word : CBFKV

Tube Cutters



Internal, operated by Bent Dwang
(Ratchet can be used)

External or Chain Wheel,
for lower row of Tubes

Internal Tube Cutter

State whether for No. 10 or No. 23a Headers

$3\frac{1}{4}$ in.

Code Word : CBFLE

Approximate Net Weight, 16 lbs. $7\frac{1}{4}$ kilos.

4 in.

Code Word : CBFMM (No. 10 Headers)

Code Word : CBFNA (No. 23a Headers)

Approximate Net Weight, 20 lbs. $9\frac{3}{4}$ kilos.

Suitable for cutting tubes from
2 in. to 4 in. external diameter.

Code Word : CBFRK

Approx. Net Weight, lbs. ...	...	10
,, ,, kilos.	...	$4\frac{1}{2}$

Tubing Chisels for cutting out Boiler Tubes

Cross Cut

Flat

Round Nose

Code Word for Set of Three complete	... ...	CBFPG
Approx. Net Weight for Set of Three complete	... ...	9 lbs. or 4 kilos

Tube Expanders

Expanders for Land Type Boilers

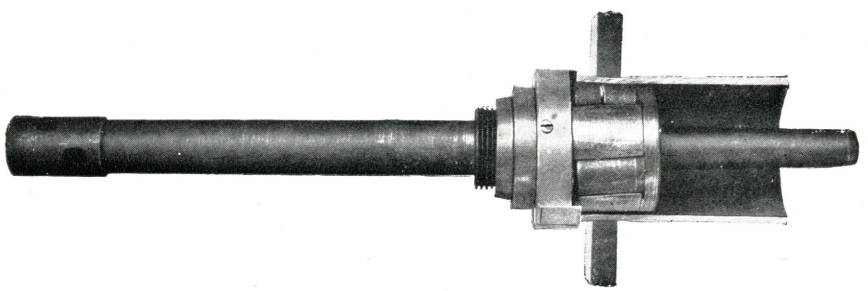


Illustration of Style 7 Expander Body Piece with Mandril.
For 4 in. Tubes.

Tube Expander body piece, as illustrated, complete with mandril and dwang only, *i.e.*, tools sufficient for expanding long section tubes only.

	4 in.
Code Word	CBFTH
Approx. Nett Weight, lbs.	27
,, ,, ,, kilos	12-24

Tube Expander complete, comprising, in addition to the above parts, the other parts necessary for expanding connecting tubes and nipples

	4 in.
Code Word	CBFSU
Approx. Nett Weight, lbs.	87
,, ,, ,, kilos.	39-46

Note.—In ordering Expanders state working pressure of Boiler if above 300 lbs. Also state thickness of tubes.

Tube Expanders

continued

Expanders for Land Type Marine Boilers

Range of Expander $3\frac{1}{4}$ ins. to $3\frac{3}{4}$ ins.

Code Word	CBFVN
Approx. Nett Weight, lbs.	$33\frac{1}{2}$
,, ,, ,, kilos.	$15\frac{1}{4}$

Range of Expander $3\frac{1}{4}$ ins. to $3\frac{5}{16}$ ins.

Code Word	CBFWO
Approx. Nett Weight, lbs.	$18\frac{1}{4}$
,, ,, ,, kilos.	$8\frac{1}{4}$

Expanders for Superheater Tubes

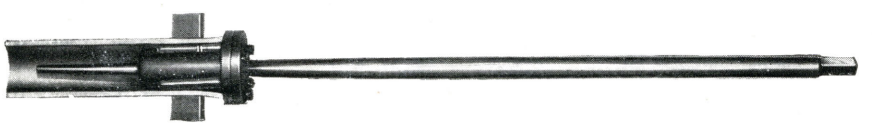


Illustration of $1\frac{1}{2}$" Expander.

$1\frac{1}{2}$ in. Superheater Tube Expander as above, with necessary mandril and wrench for expanding tubes in $7\frac{1}{2}$ inch square boxes.

Code Word : CBFXY Approx. Nett Weight, 5 lbs. ; 2.26 kilos.

$1\frac{1}{2}$ in. Superheater Tube Expander with necessary mandrils, &c., for expanding tubes in $10\frac{3}{4}$ inch square and 12 inch o/d round boxes.

Code Word : CBFZF Approx. Nett Weight, 10 lbs. ; 4.53 kilos.

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